Letters

Women and Science

Both Abelson's editorial (10 July, p. 115) and a recent article ("Physics for girls," *The Physics Teacher*, October, 1963) neglect one aspect of the situation which concerns both the shortage of physicists in general and the shortage of women physicists.

Many women in this country consider their role in society to be motherhood and the purpose of their education to be to help them enrich their homes and enable them better to raise and educate their children. If women felt at home with physics, it seems clear that not only their daughters, but their sons as well, would benefit by being encouraged to explore phenomena, question results, and ask more information, and by having their curiosity immediately satisfied and reinforced, rather than having to wait for their fathers to come home to answer their questions.

Since the parent who spends most time with small children is the mother, the task is clear. In our science-oriented culture one would like to see women stimulate as much interest in the home in physical and biological sciences as they do in music, art, and athletics.

The future mothers now in high school and college science classes are the ones who can foster awareness and appreciation of science and interest in it. We should not underestimate the significance of this happy byproduct of encouraging women to enter the scientific world.

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Wasted female brainpower is of current concern to the federal government, while at the same time there is a cry from industry that women leave their jobs too quickly. I wish to suggest that one reason for the short tenure of women scientists is industry's misjudgment of the intellectual capacity of these women.

Consider the female chemist with a bachelor's or master's degree. To earn her degree she puts in long hours in laboratories and over her books. The quality of education of the woman chemist is not affected by her sex, but her job opportunities will be.

Teachers of undergraduate chemists assume that a Ph.D. is necessary for research in industry or for college teaching. Male graduates in science are encouraged to continue for the doctoral degree, and this encouragement is so vigorous and financial aid is so available that many do continue their education.

Women are not discouraged from continuing toward the doctorate, but neither are they encouraged. For various feminine reasons most do not, but this does not lessen their qualifications as chemists. On the contrary, because so many of the capable women chemists do not continue their training, female bachelor's and master's degree holders in chemistry are on the whole superior in ability to their male counterparts who have not continued.

What jobs may these women expect to find? Most women chemists in industry work in analytical laboratories or technical libraries. Only too often these become monotonously routine and frequently could be filled more appropriately by technicians than by professional scientists.

Often the young woman chemist is assigned boring tasks with no thought that she could do anything better. Women do not major in chemistry because it is easy. Almost every chemist could have majored in something easier, and it is tragic for a woman who has completed a challenging, varied college career to be put on a job where her intelligence is not respected and her enthusiasm will be killed.

If her intelligence is not being used, it is natural for the woman to look elsewhere for a challenge. She may find teaching or marriage and a family more challenging and rewarding, and an eight-to-five job with good pay has definite advantages. Nevertheless, if a job leaves her with feelings of uselessness, it is not worth any amount of money and leisure time.

Therefore, I suggest to industry that the short tenure of women may not be the fault of the women only. Given an interesting, challenging position where she is free to use her imagination, the woman chemist may make contributions to the industry that industry itself does not now permit her to make.

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Public Scrutiny of Research Grants

The editorial "Too much freedom of information" in the issue of 29 May is most thought provoking. Wolfle suggests, as I interpret it, that neither the government agency nor the research organization that is receiving grants from it should be required to provide detailed information concerning the research project, because of the burden thus placed on the agency and because some research organizations might wish to keep some information confidential. He suggests that the only information that should be required is "the granting agency, the recipient, the principal investigator, the amount of money, and a brief description of the purpose." Any additional information would be released only when the agency or the recipient considered its release to be desirable.

This proposal, it seems to me, is in direct contradiction to our whole concept of government. Anyone who occupies public office can expect to have all the details of his background, education, and experience subjected to public scrutiny, because he holds a public trust. All the actions of every agency in general are subject to public scrutiny so that we, as citizens, can determine whether we wish them to continue. The only exceptions, and these seem to be reasonable, have to do with subjects or information which might affect the national security. I think the courts have ruled that there are very few areas which may be considered to be confidential and not open to public scrutiny.

It seems to me to be of even greater importance that research projects be open to public scrutiny. As citizens, we have a right to know how our tax money is being used and what will result after it has been expended.

As a practical matter: Anyone who applies for funds for a research project submits a prospectus describing the proposed method of conducting it and the results that are expected. Perhaps the agency that is granting the funds should make copies of this proposal available to all; and in addition, anyone who desires an intermediate report, if such is not available, should be able to obtain it from the research organization.

In summary, I would hope that Wolfle's suggestion never becomes effective, for it could extend to all phases of governmental activity.

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Fellowships from Federal Funds

Abelson's editorial in the 5 June issue (p. 1181) is mistakenly titled "Predoctoral and postdoctoral fellowships." He is not talking about predoctoral and postdoctoral fellowships at all but about research assistantships. A fellowship, as everybody—including the Internal Revenue Service—knows, is a free and unrestricted grant to help a student attain his educational objective. It requires no service and, in fact, some fellowship programs specifically prohibit service. The type of student support described in the editorial is the research assistantship, which does involve service for a specific purpose, a fact which IRS is quick to recognize.

The editorial obscures the fact that very large numbers of both predoctoral and postdoctoral students are supported by true fellowships, completely free and unrestricted. Not only in the interests of objectivity but also in fairness to the agencies whose educational judgment is impugned by the editorial, this fact should be taken into account.

There is, however, another equally unfortunate half-truth underlying Abelson's argument. He says, "Today a large proportion of these fellows receive their stipends in connection with grants given by federal agencies for specific objectives." We must ask, "Whose specific objectives?" If he means the federal agency's specific objectives, he is talking not about a grant but about a contract. In spite of the present tendency to convert a grant into a contract purely for the purpose of getting a more favorable indirect-cost allowance for the university, there is still a great difference between the two. The contract frequently is for a specific objective of a federal agency; the grant grows out of a research proposal made by a scholar and approved by a committee of his peers.

There is, unfortunately, just enough truth in the comments about "entrepreneurs of science" and "empire-builders" to be embarrassing. There are, indeed, such persons, happily not many, and they are so well marked in their departments, in their universities, and in their professions at large that they constitute a negligible danger to students, predoctoral or postdoctoral. Students are not as naïve as Abelson pictures them. They will hold still for just so much exploitation on a research team, and then they will find other means of support—if they are worth their salt. And other means of support are plentiful.

Finally, I am surprised to learn that the National Aeronautics and Space Administration has set a "valuable precedent" by awarding funds to institutions and not to individuals. I find on page 68 of the National Science Foundation's Eleventh Annual Report (1961) that "NSF created, in July 1960, an institutional grants program, conducted through Office of Institutional Grants, to assist institutions to strengthen their general research and training functions without specifying the precise research or related scientific activity to be undertaken. Its purpose is to provide optimum flexibility and simplicity of administration. . . ."

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I would like to call attention to a class of predoctoral and postdoctoral fellowships which Abelson does not mention or which he inadvertently lumps with fellowships supported by individual research grants. This is the fellowship awarded to the individual working under an academic sponsor toward research objectives stated in the application. Both NSF and NIH award postdoctoral fellowships of this type.

I have had the opportunity to work as an NIH postdoctoral fellow for the past three years, the first two spent at the University of Wisconsin. It has been my experience that this type of fellowship puts the burden of organization of research objectives on the applicant, albeit with the cooperation and general approval of the sponsor. Since an informed applicant will choose a sponsor who is working in the general research area that he himself is interested in, I think this type of fellowship fulfills the goals of creative scientific development of which Abelson speaks—perhaps to a greater extent than either the research grant or institution-sponsored fellowship.

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The editorial on pre- and postdoctoral fellowships expressed an opinion shared by me and many other recent graduates. Many of our graduate programs place emphasis on the simple mastering of knowledge and techniques, failing to stimulate the processes which lead to scientific confidence. Thus in the immediate postdoctoral years the individual may not be eager for a personal scientific challenge. His immaturity can be easily encouraged by an "entrepreneur of science."

Few institutions or granting agencies welcome new research programs without supporting data or convincing preliminary results. The young Ph.D. must therefore fit into an already existing program; and the realization of any new approaches he may propose must therefore lie within the responsibility of the postdoctoral employer.

The editorial failed to cite the beneficial impact of the direct predoctoral and postdoctoral fellowship programs (as opposed to those administered by individuals—"empire builders"). These, as well as the NASA-type institutional award, encourage early scientific maturity and the development of an increased number of qualified research centers.

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Arlt is correct when he emphasizes the legal distinction between fellowships and assistantships. In practice the difference is not very real: predoctoral and postdoctoral fellows often function as research assistants.

The fellowship program of the National Aeronautics and Space Agency has a combination of features which make it attractive. Funds for the fellowships are distributed to 110 universities, with no more than ten awards per institution. The NASA program thus contributes toward increasing the number of centers of excellence. In contrast, policies of some other agencies lead to concentration of the best fellows in a few institutions.—P.H.A.